



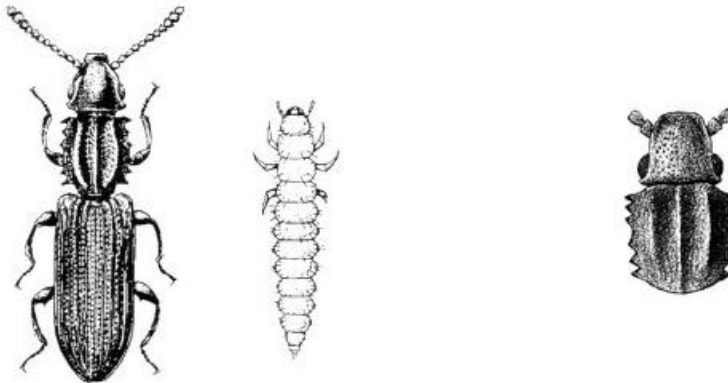
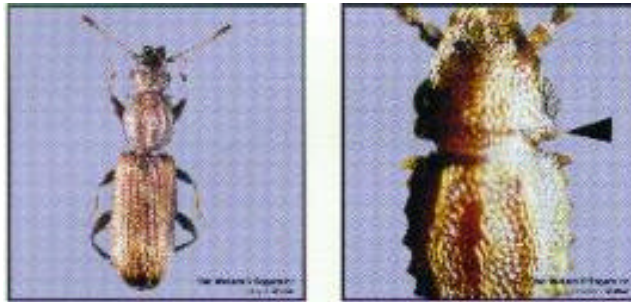
Pest Facts

Sawtoothed and Merchant Grain Beetles

Both sawtoothed (*Oryzaephilus surinamensis*) and merchant (*Oryzaephilus mercator*) grain beetles are common stored-food product pests that infest a variety of products including; cereals, cornmeal, cornstarch, popcorn, rice, dried fruits, breakfast foods, flour, rolled oats, bran, macaroni, sugar, drugs, spices, herbs, candy, dried meats, chocolate, bread, nuts, crackers, raisins, dried dog and cat food. These beetles are capable of chewing into unopened paper or cardboard boxes, through cellophane, plastic, and foil wrapped packages. Once inside, populations build up rapidly often spreading to other stored foods and into food debris accumulated in the cupboard corners, cracks, and crevices. Sometimes all life stages (egg, larva, pupa, adult) may be found. These insects contaminate more food than they consume, and usually are discovered leaving the infested food to crawl about. Adults and larvae are external feeders, feeding on finely divided food particles and not whole grain. They do not bite humans or pets, spread disease or feed on or damage facilities. These insects have running legs (ambulatory) much like cockroaches and penetrate "tightly sealed" packaging.

Identification

Both beetles are flattened, reddish-brown and about 1/10-inch long. They have six sawtooth-like projections on each side of the thorax (middle part between the head and the wing covers). It is difficult to separate these two beetles. Under magnification, the sawtoothed grain beetle has exposed eyes, whereas the merchant grain beetle has the eyes more protected by small knobs behind the eyes. Additionally, the head is more triangular in the merchant grain beetle. Males can be separated from females by observing a tooth on the femur of the hind leg. Eggs, larvae and pupae of both beetles are similar. Eggs are white, microscopic and elongated. Full-grown larvae are less than 1/8" long, with a dirty white background and yellowish plates on the back. The head is brown with three pairs of legs. The pupal case is a capsule of glued foodstuff fragments.



Life Cycle and Habits

Both beetles lay eggs singly or in small batches in the food material where the life cycle is completed. The sawtoothed grain beetle cannot fly, but the merchant grain beetle can fly. Adults usually live about 6-10 months, with some living as long as 3 years and 3 months. female sawtoothed grain beetles usually emerge in April and lay an average of 300 eggs.

Egg laying begins about 5 days after emergence and continues up to 3-4 weeks. Eggs hatch in about 8 days, larvae mature in 37 days, and pupa about 67 days. The life cycle can be completed in 51 days or as early as 27 to 35 days in warmer climates. Merchant grain beetles lay an average of 200 eggs over 28 to 42 days, requiring about 35 days to complete the life cycle. There may be as many as 6-7 generations under warm conditions of 85 degrees F to 95 degrees and 70% relative humidity, with fewer generations throughout the winter months. Adults remain active and feed. The sawtoothed grain beetle prefers cereal-based products, whereas the merchant grain beetle prefers nuts, seeds and dried fruit.

Integrated Pest Management Program

The following information describes guidelines followed during the development and implementation of comprehensive sawtoothed and merchant grain beetle management programs. While an effective program will contain many of these elements, every program is dependent on site specific parameters and should be reviewed by a pest management professional before and after implementation.

1. Specific Program Recommendations

Sawtoothed and Merchant Grain Beetle- Periodically examine all infestible products as well as the surrounding display/storage area. When an infested product is identified, immediately segregate the material to an isolated morgue location and heat (125 degrees F for one hour) or cool (5 degrees F for one day), if practical, to kill all life stages. Ensure untreated discarded material is immediately removed from the facility. If necessary, treat shelving units (i.e., cracks, crevices and supports) with an insect growth regulator. Begin active surveillance using pitfall/glue board traps combined with visual surveillance to monitor for insects as well as sanitation problems

2. General Stored Product Arthropod Pest Program Design

A. Surveillance: Identifying the Problem

Visual Inspection

All facility areas (inside and outside) must be thoroughly reviewed to identify active/potential problem areas and to document program effectiveness. Include the following:

- Outside of the facility: Keep the area around the facility clean. Keep vegetation trimmed. Do not let pallets and debris collect. These are potential harborage for rodents and insects. Eliminate horticultural plantings that attract insects (i.e. pittosporum shrubs attract flies, many flowers attract warehouse beetles). Replace any outside mercury vapor lights with sodium vapor lights which attracted fewer insects.

- Bulk display bins and dispensers: Clean around, underneath and in. Take special care to clean all inside corners.

- Shelving and display cases: Clean and dust under, on and around shelves and display cases. Prevent food particles from collecting by sealing cracks with silicone or other flexible caulk.

- Infestible Products: Check for torn bags and buildup of debris. Monitor shelving for individual insects. Inspect all infestible foods before stocking on shelves. For a list of target products, see insect description section.

- Checkout counters: Keep clean. Do not allow build-up of food matter behind or underneath scales, cash register and counter.

- Floors: Fill or eliminate cracks. Sweep and mop regularly. Inspect corners and edges for insect activity. Keep free of dust and debris. Inspect old drain holes and clean out or eliminate them if possible.

- Cellars: Keep clean and well organized. Do not allow refuse to build up or storage of damaged or returned product. Examine for pest accesses such as holes around utility lines, poor fitting doors, window screens absent or in disrepair and pest harborage such as crevices around utility boxes, sinks, door frames, etc.

- Product storage areas: Keep food off floor on pallets or shelving made of non-porous materials at least 18" from the wall. This provides an inspection and cleaning corridor. Dust ledges and window sills, examine for signs of insects. Return or discard damaged/infested stock immediately. Place in isolated (morgue area) away from other

Pheromone Trapping

Pheromones are generally species specific. Each pheromone attracts only insects of one species or those of closely related species.

Pheromone Trap Monitoring:

-Monitoring for an infestation (preventive): With traps in place, any increase in the size of a moth population will be detected. If this occurs, it is an indication that a general infestation is being established or infested merchandise has been imported into the facility

-Locating an Infestation: If an infestation is located in a specific area, traps closest to the vicinity of the infestation may have a higher than normal catch. Manual searches for the infestation may then be concentrated in this area.

-Determining the Effectiveness of Control Management Measures: When management measures are implemented and prove to be effective, traps will indicate a population reduction. If numbers remain stable or increase, control measures must be re-evaluated.

-Indication of Need for Improved Protection: A trend indicating elevated trap counts may



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B. Exclusion/Sanitation

Seal off/repair/pest proof possible entry points and eliminate harborages. These include improperly stored or excess equipment, poorly fitted doors/windows/screening, cracks, crevices and holes, vents, etc. Ensure high levels of sanitation. (See inspection/monitoring)

C. Preventive Inventory Stocking Procedures.

a. Warehouse and Receiving Area

- Date stock as it enters warehouse or receiving area. Rotate on first in, first out basis.

- Rotate entire inventory on a regular basis

- Keep excessive inventory down to help facilitate rotation. Buying a large lot on sale and storing it may lead to problems unless it can be rotated quickly.

- Keep slow moving products under constant surveillance

D. Suppliers/Distributors

Suppliers/distributors are an important link in the food distribution chain and must be considered when planning a pest management program. Suppliers have their own pest management problems to handle and sometimes are, unavoidably, the source of infestation/re-infestation.

Keep excellent documentation. If you are regularly receiving infested merchandise from a particular supplier/distributor, consider the following actions:

- Carefully examine incoming merchandise

- Document all problems, offer suggestions to the distributor/supplier. Change the label of a consistently infested product.

- Change supplier/distributor if the problem is not resolved

E. Climatic Manipulation

Climatic conditions have an important impact on insect populations. Cool and dry conditions tend to suppress growth and development and may result in mortality. Warm and humid conditions tend to speed development, increasing the number of generations produced per year. If possible, place infestible products (i.e., pet foods, pasta) in cool/dry storage areas or, if possible, refrigerator/freezer.

F. Chemical Control

Chemical control should only be considered in conjunction with other techniques and performed by a certified applicator. Crack and crevice (residual) treatments are often used in areas where adult arthropods rest or larvae migrate to pupate. Space sprays or fogs are used periodically in isolated areas, mainly to reduce adult density (space sprays are not residual insecticides and only affect those insects which directly contact the chemical during application). Trapping may also be used for surveillance and in isolated areas to

reduce the size of isolated or small populations. **Remember, application of insecticide without addressing the causes of an infestation will result in limited short-term success.**

For additional information regarding stored product pest management, contact your local pest management professional or DSCP at 510-337-8122, DSN 686-8122 or email paa5245@exmail.dscp.dla.mil.

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